



GEOTECHNICAL REPORT

Residence for S & K Fullham
Weka St, Mangawhai
Lot 8 DP 560995

23 November 2021

Reference: 21/446/WE

Deane Consultancy Ltd
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TABLE OF CONTENTS

	Page
1 Preamble	2
2 Site Description	2
3 Site Geology	2
4 Other Relevant Documents	2
5 Site Investigations	2
6 Findings	2
7 Earthquake Hazards	3
8 Ground Stability	3
9 Summary & Recommendations	3
10 Construction Observations	5
11 Design Certification	5
Appendices	

1) PREAMBLE:

Deane Consultancy has been asked to conduct a project specific geotechnical investigation with recommendations for foundations and storm water disposal for a single level home on a concrete raft floor to be constructed on the site.

2) SITE DESCRIPTION:

The site is a near rectangular road front lot with frontage to Weka Street extension to the northern boundary and other residential sites to south and west and a stormwater detention pond to the east.

The site is a near level terrace stepped up approx. 1m above the road and slightly below the site to the west and 2.6m above the existing dwelling to the south with a steep batter between.

3) SITE GEOLOGY:

The geological map finder "Q-map describes the site as: "Late Quaternary dunes, composed of loose to poorly consolidated sand in mobile and fixed dunes locally with paleosols and peat. The site and its western neighbor have obviously been created by placing fill as evidenced by the batters present.

4) OTHER RELEVANT DOCUMENTS:

A geotechnical report by Foundation Engineering (Coffey Geotechnics) dated 4 April 2007 that was used to support the subdivision and an earthworks completion report by Hawthorn Geddes dated 17 May 2016 have been reviewed by this reports author.

Significant earthworks are not required for the proposed development.

The site is within the area served by the public waste water disposal system.

The site discharges into the stormwater retention pond constructed to serve the subdivision and has design provision for 40% impermeable surfaces on the lots created.

5) SITE INVESTIGATIONS:

These were carried out on 18/10/2020 by K Canton and involved four Scalar Penetrometer tests through the topsoil and subsoils.

The test locations were put down along the top of the bank and within the body of the upper level terrace as indicated on the attached plan.

6) FINDINGS:

Scalar Penetrometer Tests:

The test results indicate variable results particularly within the upper 1200mm of tests 1 and 2 which were taken in the north east and south east corners of the level building platform. Both tests found stiff material at 2.4m which approximates the pre-development level of the site to the south.

Tests 3 and 4 taken in the south west and north west corners found soft material in the upper 1.0m and inconsistent results below indicating uneven compaction.

Discussions with the southern neighbour confirmed the site has been filled with material cut from the subdivision slope to the North West.

The poor results along the eastern side may indicate the batter has not been cut back after placing and hence is not well compacted for its full depth.

7) EARTHQUAKE HAZARD

7.1 Ground Shaking:

The Auckland and Northland regions have a hazard factor Z of 0.13 as defined by NZS 1170.5. We consider that the site is class C (NZS 1170.5) based on typical depth of the Dune sand soils. Therefore, this site has a low risk of damage to the proposed structure resulting from ground shaking during the 50-year design life.

7.2 Liquefaction risk:

Liquefaction has potential to occur in silts, sands and gravels, especially where groundwater tables are high, and the soils are in a loose state. The risk of liquefaction within the soils identified at this site is considered to be low due to the compact nature and deep water table of the site.

8) GROUND STABILITY:

The site currently has no obvious signs of instability in the proximity of the proposed building platform.

The site batters slope at 1v:2h and therefore are considered to have marginal stability.

To ensure long term stability of the building platform it is considered necessary to ensure foundations in proximity to the batters are provided with capacity to resist any resultant lateral loading or the batters reduced.

9) SUMMARY & RECOMMENDATIONS:

The site shall remain stable after the construction of the proposed dwelling provided the following recommendations are adopted for the development detailed on the plans.

9.1 Earthworks:

All cut and fill operations on site shall be subject to review by a geotechnical engineer with regard to the recommendations of this report and in accordance with the earthworks specification attached.

Fill may be retained with walls designed in accordance with the recommendations of this report or battered in accordance with the earthworks specification attached.

The existing batters shall require retaining to the toe either with a cantilever timber wall or placement of rock revetment or other suitable retaining system.

Alternatively batters may be reduced to 1v: 3h by adding compacted fill or cutting back the slope or a combination of the above

9.2 Foundation Design:

All building foundations shall have specific engineering design by a Chartered Professional Engineer familiar with this reports findings.

It is recommended that the dwelling and garage slab be fully supported on driven timber piles with the installation under the supervision of a Chartered Geotechnical Engineer.

Driven piles may be designed using a dynamic pile driving method such as the Hiley formula.

Pod floor and in-situ concrete slabs shall be fully piled and designed for expansive site class "A" relative to AS 2870: constructed over a minimum 50mm layer compacted hard-fill (compaction not critical) extending 0.5m outside the building footprint, placed prior to adding fines and sand blinding.

Conventional foundations shall be excavated or piled down to the stiff original soils present below the fill approx. 2.5m deep.

For the original soils encountered in the boreholes the following design parameters are deemed appropriate.

- Undrained shear strength	Su	= 70 kPa
- Apparent Cohesion	c'	= 0 kPa
- Apparent Internal angle of Friction	Ø	= 28 °
- Bulk Density (weight density)	Y	=18 kN/m ³
- Ultimate Bearing Capacity	qu	= 300 kPa
- Ultimate Pile Skin Friction	τsf	= 15 kPa

A capacity reduction factor, to convert Ultimate to dependable capacity, of 0.5 shall be applied.

9.3 Retaining Wall Design:

Retaining walls shall be constructed to specific engineering design for actual retained height and surcharge loads in accordance with the recommendations of this report.

Timber pole retaining walls may be designed for active (Ka) earth pressure and rigid walls and walls supporting building foundation loads shall be designed for at rest (Ko) earth pressure.

Earth pressure and embedment depths shall be determined in accordance with B1/VM4 with allowance for surcharge loads, upslope and downslope effects. Wall heights where ground slopes away below a retaining wall shall be taken from an elevation where the ground surface is three pile diameters in horizontal distance from the downhill face of the poles or structure.

Soil design parameters as scheduled in section 9.2 shall be adopted for specific engineering design.

9.5 Stormwater:

The KDC development standards require Stormwater attenuation of flows to pre-development rates, which is provided by the subdivision storm water attenuation system to the east.

Some means of controlling or directing overland flow to the south shall be required.

This may be combined with a retaining structure if required or by a swale drain. Shaping the yards to keep flow away from the building with all paving and drive discharging to the public drainage system shall be installed.

10) CONSTRUCTION OBSERVATIONS:

Earthworks, retaining walls (if any), foundation construction and Stormwater control systems should be observed by Deane Consultancy Limited to ensure that the assumed soil parameters and other requirements of section 9 of this report are achieved on site.

11) DESIGN CERTIFICATION:

When developed in accordance with the recommendations of this report:

The ground conditions at the site are suitable for construction of the proposed dwelling.

The land on which the building work is to take place is not subject to, and is not likely to be subject to, instability.

The building work is not likely to accelerate, worsen or result in instability of the lot or any other property.

PLEASE NOTE:

- 1) *This report is based on investigations carried out at a limited number of locations. It must be understood that soil conditions may vary across the site from those encountered at the test pit.*
- 2) *Expansive clay soils are prone to desiccation and shrinkage from tree roots. To avoid damage to foundations and building it is recommended that any trees planted are placed at no closer to the building than 0.75 times their mature heights.*
- 3) *This report has been prepared for the sole use of S & K Fullan for the purpose defined in the reports preamble.*
- 4) *Deane Consultancy Ltd accepts no liability to any other party for the use of this report, its findings or recommendations or for its use for any other purpose, without prior review and agreement in writing by Deane Consultancy Ltd.*

Attachments:

- 1- Plan , SPT Results & GNS Web map.
- 2- Fill Placement Specification



Prepared by _____ **K J CANTON (BE Tech, LBP)** Date **24/11/2021**



Reviewed by _____ **P A DEANE (CMEngNZ CPEng)** 30 November, 2021

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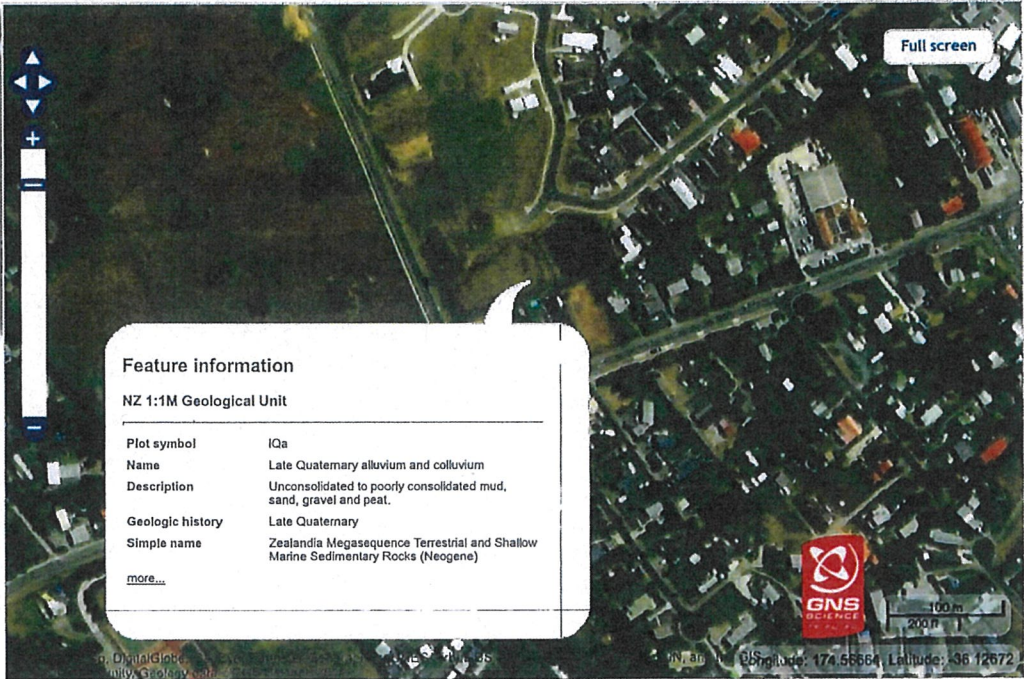
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Layer menu

- 1:250K Geology (more detail)
- 1:1M Geology
 - Faults
 - Miscellaneous Boundaries
 - Miscellaneous Polygons
 - Geological Boundaries
 - Geological Units



Feature information

NZ 1:1M Geological Unit

Plot symbol	IQa
Name	Late Quaternary alluvium and colluvium
Description	Unconsolidated to poorly consolidated mud, sand, gravel and peat.
Geologic history	Late Quaternary
Simple name	Zealandia Megasequence Terrestrial and Shallow Marine Sedimentary Rocks (Neogene)
more...	



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Home

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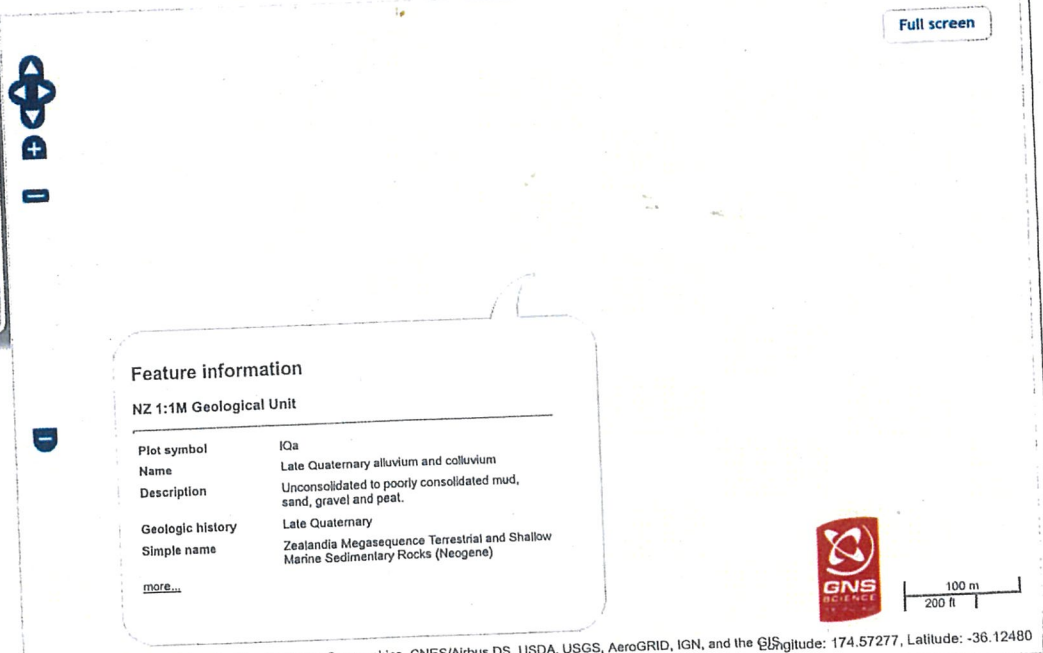
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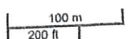
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Geology data ©GNS Science 2014

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About NZ Geology

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SCALA PENETROMETER READINGS

SP 1

No	Tape	per Blow	Blows	Depth	No	Depth	No	Depth	No	Depth
0	1070			0	0	0	0	0	0	0
5	660	82.0	5	410	5	570	5	570	5	570
5	400	52.0	10	670	5	880	5	880	5	880
5	1400	0.0	10	670	5	1190	5	1190	5	1190
5	1030	74.0	15	1040	5	970	5	970	5	970
5	890	28.0	20	1180	5	760	5	760	5	760
5	780	22.0	25	1290	5	610	5	610	5	610
5	680	20.0	30	1390	5	410	5	410	5	410
5	590	18.0	35	1480	5	330	5	330	5	330
5	510	16.0	40	1560	5	180	5	180	5	180
5	440	14.0	45	1630	5	1180	5	1180	5	1180
5	375	13.0	50	1695	5	1050	5	1050	5	1050
5	300	15.0	55	1770	5	940	5	940	5	940
5	1300	0.0	55	1770	5	840	5	840	5	840
5	1210	18.0	60	1860	5	750	5	750	5	750
5	1130	16.0	65	1940	5	680	5	680	5	680
5	1055	15.0	70	2015	5	600	5	600	5	600
5	990	13.0	75	2080	5		5		5	
5	930	12.0	80	2140	5		5		5	
5	870	12.0	85	2200	5		5		5	
5	830	8.0	90.0	2240	5		5		5	
5	770	12.0	95.0	2300	5		5		5	
5	720	10.0	100.0	2350	5		5		5	
5	660	12.0	105.0	2410	5		5		5	
5	620	8.0	110.0	2450	5		5		5	
5	575	9.0	115.0	2495	5		5		5	
5	530	9.0	120.0	2540	5		5		5	
5	490	8.0	125.0	2580	5		5		5	
5	440	10.0	130.0	2630	5		5		5	
5	410	6.0	135.0	2660	5		5		5	
5	360	10.0	140.0	2710	5		5		5	
5	1360	0.0	140.0	2710	5		5		5	
5	1320	8.0	145.0	2750	5		5		5	
5	1290	6.0	150.0	2780	5		5		5	
5	1250	8.0	155.0	2820	5		5		5	
5	1215	7.0	160.0	2855	5		5		5	
5	1180	7.0	165.0	2890	5		5		5	
5	1150	6.0	170.0	2920	5		5		5	
5	1120	6.0	175.0	2950	5		5		5	

SCALA PENETROMETER READINGS

SP 2

No	Tape	per Blow	Blows	Depth	No	Depth	No	Depth	No	Depth
0	1070			0	0	0	0	0	0	0
5	500	114.0	5	570	5	570	5	570	5	570
5	190	62.0	10	880	5	880	5	880	5	880
5	1190	0.0	10	880	5	260	5	260	5	260
5	970	44.0	15	1100	5	1250	5	1250	5	1250
5	760	42.0	20	1310	5	1120	5	1120	5	1120
5	610	30.0	25	1460	5	1040	5	1040	5	1040
5	410	40.0	30	1660	5	980	5	980	5	980
5	330	16.0	35	1740	5	890	5	890	5	890
5	180	30.0	40	1890	5	820	5	820	5	820
5	1180	0.0	40	1890	5	780	5	780	5	780
5	1050	26.0	45	2020	5	690	5	690	5	690
5	940	22.0	50	2130	5	640	5	640	5	640
5	840	20.0	55	2230	5	590	5	590	5	590
5	750	18.0	60	2320	5	530	5	530	5	530
5	680	14.0	65	2390	5	480	5	480	5	480
5	600	16.0	70	2470	5	410	5	410	5	410

SP 3

No	Tape	per Blow	Blows	Depth	No	Depth	No	Depth	No	Depth
0	970			0	0	0	0	0	0	0
5	780	38	5	335	5	335	5	335	5	335
5	620	32	10	515	5	515	5	515	5	515
5	450	34	15	695	5	695	5	695	5	695
5	340	22	20	825	5	825	5	825	5	825
5	240	20	25	905	5	905	5	905	5	905
5	1240	0	25	905	5	1240	5	1240	5	1240
5	1150	18	30	965	5	965	5	965	5	965
5	1060	18	35	1055	5	1055	5	1055	5	1055
5	980	16	40	1125	5	1125	5	1125	5	1125
5	915	13	45	1165	5	1165	5	1165	5	1165
5	820	19	50	1255	5	1255	5	1255	5	1255
5	740	16	55	1305	5	1305	5	1305	5	1305
5				1355	5	1355	5	1355	5	1355
5				1415	5	1415	5	1415	5	1415